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EDWARD TUCKERMAN.

I. Biographical Sketch.

[The following sketch is condensed from the notice of Dr. Tuckerman in the Amherst *Record* of March 17, which we understand is from the pen of Prof. Tyler.*—EDS.]

Edward Tuckerman, professor of botany in Amherst College, died on Monday the 15th instant, at his residence in Amherst, of which town he was a citizen for more than thirty years.

Edward Tuckerman was the eldest child of Edward and Sophia (May) Tuckerman, and was born in Boston December 7, 1817; prepared for college at Ingraham's school and the Boston Latin school; entered the Sophomore class at Union College 1834, being graduated B. A. in 1837. Thence he proceeded to Cambridge and entered the Harvard Law School, taking the degree LL. B. in 1839. He remained at the Law School till 1841, during which time he took a special course at the Divinity School, and then went abroad and studied several years in Germany, devoting himself particularly to the study of history, philosophy and botany.

Returning to this country, he joined the Senior class of Harvard College, being led to that step by friendship for several of its members, and graduated with them the following year. He subsequently received the degree of M. A. from both Harvard and Union, and LL. D. from Amherst. A taste for the natural sciences very early manifested itself, and during his course at Union College he was appointed curator of the museums. His connection with Amherst College dates from 1854, the years previous being spent in the pursuit of his favorite studies at Cambridge. In Amherst he held the position of lecturer in history from 1854–55, and again from 1858–1873, and professor of Oriental history from 1855–58. It was not till 1858 that he was appointed to the chair of botany, which he held thereafter till the day of his death.

He was married May 17, 1854, at Boston, to Sarah Eliza Sigourney, daughter of Thomas P. Cushing, and leaves no children.

Professor Tuckerman was a student all his life, and studies once begun were never relinquished till feebleness and the inroads of disease compelled him to lay them aside. He was a specialist, and yet he was not one, for he was a scholar in the truest sense of the word, and his attainments were as wide and varied as his reading. His linguistic acquirements were remarkable, and his literary correspondence with foreign scientists was carried on in other languages than his own. In his use of words he was espe-

* Professor Goodell. See p. 195.

cially nice and discriminating, selecting those which best interpreted the meaning he wished to convey, and frequently anticipating their use, giving them a force which has since been recognized and accepted.

His literary work commenced at the age of fifteen, and between 1834 and 1841 we find him contributing to the *Churchman* a series of fifty-four articles entitled "Notitia Literaria" and "Adversaria," embracing a wide range in criticism, biography and theology. As we read their pages we scarcely know which to wonder at most, the extent and thoroughness of his reading, or the ripeness and maturity of his expression. The boy of seventeen was a full grown man in the stature of his thought, and we can well understand the astonishment with which he was regarded when he first presented himself before the scholars with whom he had long been in correspondence. This same interest in general literature followed him through his life. In 1865 he edited a reprint of "New England Rarities" by John Joselyn, Gent. [A few pages of this quaint volume are devoted to descriptions of plants, most of the species intended being identified by the editor.] Scattered through the publications of the Antiquarian and Genealogical Societies will be found many of his contributions, and recently he has written several articles, chiefly criticisms, in the *Church Eclectic*.

Notwithstanding his close and unwearied application to the chosen study of his life, he still found time to keep abreast of the literature of the day in theology, history and travel. He was a pioneer in the study of the flora of the White mountains, and the ravine which bears his name and the contributions to Starr King's "White Hills" will be a lasting monument to the enthusiastic student who so thoroughly explored them. His scholarly ability was recognized at home and abroad by election to membership in many literary and scientific societies.

II. Bibliographical Sketch.

HENRY WILLEY.

[No attempt is made in the following sketch to enumerate anything but the scientific writings of Dr. Tuckerman.]

Prof. Tuckerman commenced the study of lichens in 1838, and made explorations in the vicinity of Boston and in the White mountains. The results of these studies appeared in the *Journal* of the Boston Society of Natural History under the following titles: "An enumeration of some lichens of New England," read Dec. 5, 1838, vol. ii. pp. 245–261; "A further enumeration," etc.,

read in March, 1840, vol. iii. pp. 281–305; "Further notice of some N. E. Lichens," read in March, 1841, vol. iii. pp. 438–464; "A further notice of some alpine and other lichens of New England," vol. v. pp. 93–103, January, 1845. These papers give the first notices of the alpine lichen flora of the White mountains, and contain an account of the systematic classification of lichens up to that time, as developed in the writings of Linnæus, Acharius, Fries and others. In "Observations on some interesting plants of New England," in *Am. Jour. Science*, xlv (1843), 27–49, he mentions two lichens, one of which has not, however, held its place as a species. In 1845 at Cambridge appeared "An Enumeration of North American Lichens." The first part of this little work is an essay on the natural systems of Aken, Fries and Endlicher, which is followed by a general view of the structure of lichens and an enumeration of those of North America, arranged according to the Friesian system. The "Synopsis of the Lichens of New England, the other Northern States and British America," Cambridge, 1848, was the first full descriptive list of our lichens published in this country. It enumerates and describes 295 species of which twenty are new.

In Lea's "Catalogue of the plants of Cincinnati," Philadelphia, 1849, is a list of 53 lichens arranged by Prof. Tuckerman. In Agassiz's "Lake Superior," Boston, 1850, is a list of seventy-one lichens arranged by him.

Between 1847 and 1855 Professor Tuckerman issued at Cambridge "Lichenes Americæ Septentrionalis exsiccati," a collection of about 150 species of lichens, mostly from the White mountains. Up to this period his studies appear to have been confined mainly to the temperate region of North America. But soon they began to embrace a larger field and to assume a wider scope. And it was this period that the application of the microscope to the study of lichen structure opened wider views and rendered necessary some modification of opinions in regard to system. In the *Am. Jour. Sci.* II. xxv. 422–430 (May, 1858) and xxviii. 200–206 (Sept., 1859), were two supplements to an "Enumeration of North American Lichens," describing many new species and including plants from the Southern states and from California. In 1860 he began contributing his "Observationes Lichenologicæ" to the *Proceedings* of the American Academy, in which he showed a constantly increasing range of knowledge, breadth of view; and power of independent judgment. These papers were published in vol. iv. pp. 383–407 (1860); v. 383–422 (1862); vi. 263–287 (1864); and xii. 166–185 (1877). The second and third of these papers are largely devoted to the Cuban collections of

Charles Wright; a portion of this collection was issued in 1864 under the title "Caroli Wrightii Lichenes Cubæ curante E. Tuckerman." The other portion was sent to Dr. Nylander, of Paris, for determination, in whose hands it remained for many years, when it was transferred to Dr. J. Müller, of Geneva, Switzerland, by whom it was issued in 1884, but with most of the plants still unnamed and undescribed, much to the disappointment of those who had purchased this noble collection hoping to find it an aid in the determination of tropical lichens. The determinations of the Pyrenocarpæ were, however, published by Dr. Müller in 1885, and that of the Graphideæ may perhaps be expected before long.

The "Lichens of the Wilkes' Exploring Expedition," published in 1861, were described by Prof. Tuckerman, illustrated with admirable drawings by Mr. Sprague.

The "Lichens of California, Oregon, and the Rocky mountains," pp. 35, Amherst, 1866, foreshadowed the systematic views which the author had adopted, and which he was preparing to develop in his subsequent work, the *Genera*.

The "Lichens of the Hawaiian Islands" collected by Horace Mann was published in the *Proceedings* of the Am. Acad. vii. 223–234 (1866).

The "Geological and Natural History survey of North Carolina" by Rev. M. A. Curtis, Raleigh, 1867, contained a list of lichens of which it was said that it had been arranged by Prof. Tuckerman. But he refused to acknowledge it as it had been made up from an old list with changes and additions which he had not been permitted to see.

In 1872 appeared the result of over thirty years' study, observation and reflection, the "Genera Lichenum" pp. xv. 281, Amherst. Always adhering to these systematic views, he adapted to them the changes rendered necessary by the growth of knowledge while maintaining their main features. The main features of this work are the comprehensiveness of its views, its ample discussion, derived from a wide range of knowledge, and almost requiring an equal knowledge duly to estimate them, its comprehensiveness in regard to the limitation of species, and its rejection of the chemical tests by which species have been indefinitely multiplied in Europe. His views have met with scant recognition there where it has become the custom, as he once wrote, to consider every marked variety as a species and every marked species as a genus; but if lichens survive the onslaughts now making on them by those who deny their autonomic existence, the philosophical views of Tuckerman must at length prevail, and they

should be the guide of future students of this difficult class of plants.

It now remained for Tuckerman to embody his ideas in a descriptive work including all the North American lichen flora, the first part of this work "A synopsis of the North American Lichens comprising the Parmeliacei, Cladoniei and Cœnogoniei," pp. xx. 262, was published in Boston in 1882. In this work his conservative views in regard to species, and his admirable faculty of bringing together allied plants and showing their relations, are finely exhibited; while the descriptions are models of clearness and conciseness, and have not their equals in the English or any other language. But this work was destined to remain incomplete. His health began to fail, he frequently became discouraged, he suffered the demands of others upon his time to divert him from its regular purpose, and he felt pained at the absolute want of public recognition abroad of his first part. But still he labored on as long as possible, up to within a few months expressing his determination to go on. But it could not be, and his monument is incomplete, though it is to be hoped that some portion of his manuscript may be in a condition that will enable it to be issued in a final supplement.

It only remains to notice some minor lichenological publications:

Can lichens be determined by chemical tests? *American Naturalist*, ii. 104–107 (1868), takes the negative side of the question.

A catalogue of plants growing without cultivation within thirty miles of Amherst College, by Edward Tuckerman and Charles C. Frost, Amherst, 1875, lichens, pp. 54–61.

The question of the gonidia of lichens, *Am. Jour. of Science*, III. xvii. 254–256 (1879), in which reference is made to the discoveries of Dr. Minks, in regard to the microgonidium, which he regarded as firmly established, and as deciding the question as to the autonomy of lichens.

Lichens of the Howgate Polar Expedition of 1877–78, Washington 1879, pp. 167, 168.

Two lichens of Oregon (Sticta Oregana and Rinodina Hallii), *Bull. Torr. Bot. Club*, v. 20 (1874).

Lecidea elabens, *Flora*, 1875, pp. 63, 64, an exclamation against this name being attached to Lecidea melancheima Tuckerm.

Lichens of Kerguelen's Land, *Bull. Torr. Bot. Club*, vi. 57 (1875).

U. S. Exploration of the 40th parallel, Washington 1872, lichens, p. 412.

U. S. Geological survey west of the 100th meridian, Washington, 1878, lichens p. 350.

New western lichens (Lecidea Brandegei, L. Pringlei, Acolium Sti. Jacobi, Pyrenothamnia Spraguei), *Bull. Torr. Bot. Club*, x. 21 (1883).

A new Ramalina (R. crinita), *Bull. Torr. Bot. Club*, x. 43 (1883).

Two lichens of the Pacific coast (Lecanora melanaspis Ach., Staurothele Brandegei Tuckerm.), *Bull. Torr. Bot. Club*, xi. 25 (1884). This was his last publication.

There may be one or two short papers on lichens in the *American Journal* which are not noticed here, but they are not important.

[We take the liberty of adding to the above list the following:

On Oakesia, a new genus of the order Empetreæ, Hooker's London *Jour. Bot.* i (1842), 443–447.

Enumeratio methodica Caricum quarundam, Schenectady, *Riggs*, 1843.—In a letter to Mr. Willey accompanying this the author says: "I send a brochure of mine upon CAREX written some 20 years since when I was tolerably familiar with the common species both of Europe and America * * * I collected in most parts of the north of Europe in 1841–2 and formed a large herbarium from my correspondents' gifts and exchanges, the whole of which I gave afterwards to Boott of London. Since his death the greater part of this has been returned to me." This little work is quite remarkable for its keen insight into the relationships of the numerous species of this difficult genus.

Observations on some N. England plants, with characters of several new species, *Am. Jour. Sci.* II. vi. (1848), 224–232.

Observations on some American species of Potamogeton, *Am. Jour. Sci.* II. vii (1849), 347–360.

Lichenes, Pacific R. R. Rept. vi. 94 (1857).—EDS.]

Revision of North American Hypericaceæ.—I.

JOHN M. COULTER.

Having studied the North American species of Hypericaceæ with all the material to be had at Cambridge, it seems to be proper, before putting the results into a more permanent shape, to present them to botanists for their criticism, that they may test them in the herbarium and field, and that the limitations of certain species may be better defined. It is with the earnest request

that botanists will thoroughly examine this work during the coming season that this paper is presented, and any specimens which will correct either the characters or ranges given will be received as a great favor. Of course work done at the Harvard Herbarium is of itself an acknowledgment of the great courtesy that prevails there, and the patient criticism given to these pages by Dr. Gray has given to them probably their greatest value.

Our three genera may be grouped and characterized as follows:

* *Hypogynous glands none.*

1. **Ascyrum.** Sepals 4, very unequal, decussate; the two outer very broad and flat; the inner much smaller. Petals 4, oblique, convolute in æstivation, deciduous. Stamens numerous, distinct. Ovary one-celled, with 2 to 4 parietal placentæ: styles 2 to 4, distinct or united below: stigmas not capitate. Capsule ovoid.

2. **Hypericum.** Sepals 5 (rarely 4), similar. Petals 5 (rarely 4), oblique, convolute in æstivation, deciduous or marcescent. Stamens numerous (sometimes few), in 3 or 5 clusters: filaments distinct or united at the very base into phalanges. Ovary one-celled with parietal placentæ, or 3 to 5-celled with placentæ in the axis: styles 3 to 5, distinct or united even to the apex: stigmas often capitate. Capsule conical to globose.

** *Hypogynous glands three.*

3. **Elodea.** Sepals 5, equal. Petals 5, equal-sided, imbricate in æstivation, deciduous. Stamens 9 (rarely more), strongly triadelphous; the large orange-colored glands alternating with the phalanges. Ovary 3-celled: styles 3, distinct: stigmas not capitate. Capsule elongated-oblong.

1. ASCYRUM L. St. Peter's-wort.

Low suffruticose leafy plants; with small black-dotted leaves and nearly solitary light yellow flowers; pedicels bibracteolate.—Gen. 903; Torr. & Gray, Fl. i. 156 & 671; Gray, Gen. Ill. i. 211, t. 91; Benth. & Hook. Gen. Plant. i. 164, excl. syn. *Isophyllum*.—A genus of 5 species, peculiar to Eastern North America and the West Indies.

* Diffuse: branches somewhat two-edged and winged above: leaves narrowed at the base, not clasping: inner sepals very small (about half line long) or obsolete, petaloid: petals about as long as the outer sepals: styles two, distinct or united.

† Pedicels long (¼ to ½ inch), bibracteolate near the base: inner sepals obsolete or nearly so: styles as long as the ovary.

1. **A. pumilum** Michx. Low (3 to 9 inches), with spreading branches: leaves linear-oblong to oval, sometimes spatulate or narrowly obovate, 2 to 4 lines long, about a line wide: pedicels becoming more or less reflexed: petals obovate, little longer than

the ovate, acute or obtuse outer sepals.—Fl. ii. 77; Torr. & Gray, Fl. i. 156.

A. pauciflorum Nutt. Gen. ii. 15; Chois. in DC. Prodr. i. 555.

Pine barrens of Georgia and Florida.

The specimens examined were all from Florida, collected by Canby, Chapman, Curtiss, and J. D. Smith. The original station given by Michaux is in Georgia, in which he is confirmed by Elliott and Nuttall, as well as by subsequent collections.

† † Pedicels shorter (a line or two), bibracteolate close to the flower: inner sepals evident: styles short.

2. **A. Crux-Andreæ** L. Low (half to a foot or less), much branched at base, generally decumbent: leaves narrowly obovate-oblong, ½ to 1½ inches long, 3 to 4 lines wide, more or less plainly biglandular at base: pedicels about a line long: outer sepals ovate or cordate-ovate, mostly obtuse: petals linear-oblong to narrowly obovate.—Spec. ed. 2, 1107, excl. Pluk. syn. (which is *Hypericum mutilum*), not ed. 1, 787, *fide* Torr. & Gray, Fl. i. 671; Chois. in DC. Prodr. i. 155; Torr. & Gray, Fl. i. 156, in part.

A. multicaule Michx. Fl. ii. 77.

From Nantucket, Mass., through the pine-barrens of New Jersey to Virginia, E. Texas, and S. Illinois.

The narrow-leaved forms south of this range should be referred to the following species, with which A. Crux-Andreæ has unfortunately been confounded. The western forms all seem to be taller and more robust than those of the Atlantic States. In reference to the confusion of the synonymy of A. Crux-Andreæ and A. hypericoides consult Torr. & Gray, Fl. i. 671, where the best course for settling the difficulty is suggested. The specimens examined were from Nantucket (*Mrs. Owen*), New Jersey (*Gray, Parker*), Pennsylvania (*Porter*), Virginia (*Curtiss, Dana*), S. Illinois (*Vasey*), W. Tennessee (*Fendler*), E. Arkansas (*Harvey*, 52), E. Texas (*Hall*, 36 in part).

3. **A. hypericoides** L. Taller (1 to 2 feet), more erect, branched above: leaves linear to linear-oblong, 3 to 10 lines long, a line or two wide, conspicuously biglandular at base: pedicels longer: outer sepals usually narrower, often acute.—Spec. ed. 1, 788, as to Plum. syn., ed. 2, 1108, excl. Pluk. syn.; Chois. in DC. Prodr. i. 555, in part; Griseb. Fl. Brit. W. Ind. 112.

A. Crux-Andreæ Torr. & Gray, Fl. i. 156, in part; Griseb. Plant. Cub. 40 Chapm. Fl. 38; indeed of all southern authors.

A. Crux-Andreæ var. *angustifolium* Nutt. Gen. ii. 16; Torr. & Gray, Fl. 1. 156.

A. Plumieri Bertol. Bot. Misc. xiii. 19, t. 3, f. 3.

South Carolina to Florida, Louisiana, and Texas. Also in the Bermudas, W. Indies, and Mexico.

Much uncertainty has arisen from attempting to reduce A. hypericoides to a form of A. Crux-Andreæ, but the larger more branching habit, narrower leaves with conspicuous basal glands, as well as a decidedly more southern range, serve to distinguish it. The Bermuda and Jamaica plants are typical forms of the species, and can by no means be taken for forms of A. Crux-Andreæ, but those of the continent are more apt to be perplexing. The specimens examined were from S. Carolina (*Ravenel*), Florida (*Curtiss*, 243), Louisiana (*Drummond*, 90 and 92), Texas (*Hall*, 36 in part, *Lindheimer*), Mexico (*Berlandier*, 989, 2419, *Botteri*, 373), Cuba (*Wright*, 2129), Jamaica (*Alexander*, *Grisebach*, 1497. 811), Bermuda (*Lane*, 331 in part).

** Erect, stouter, a foot or two high: stems simple or branched above, conspicuously two-edged, even winged: leaves broader and thicker, more or less clasping: pedicels 2 to 6 lines long: inner sepals 3 to 6 lines long, sometimes as long as the outer, seldom petaloid: petals mostly much longer than the outer sepals: styles 3 (rarely 4), generally distinct.

4. **A. stans** MICHX. Leaves oblong to oval, closely sessile and somewhat clasping, an inch or two long and 5 or 6 lines wide: pedicels bibracteolate near the middle: outer sepals ovate to orbicular-cordate; inner ones lanceolate: styles short.—Fl. ii. 77; Chois. in DC. Prodr. i. 555 (but not "2-styled"); Torr. & Gray, Fl. i. 157; Gray, Gen. Ill. i. 212, t. 91.

A. hypericoides L. Spec. 788, as to Pluk. syn.; Pursh, 373.

Barrens of New Jersey and E. Pennsylvania to Florida, Louisiana, and W. Texas.

In a southern form (var. *obovatum* Chapm.) the lower leaves taper to the base and become almost obovate. The specimens examined were from New Jersey (many collectors), E. Pennsylvania (*Porter*), Florida (*Curtiss*, 244), Louisiana (*Drummond*, 91, also *Hale*, a very large specimen), W. Texas (*Young*).

5. **A. amplexicaule** MICHX. Leaves ovate-cordate, often broadly so, clasping, half an inch or more long and nearly as wide: pedicels with very small bractlets near the base or none: outer sepals broadly ovate-cordate, resembling the leaves; inner ones linear-lanceolate: styles about as long as the ovary.—Fl. ii. 77; Torr. & Gray, Fl. i. 157.

A. stans Willd. Spec. iii. 1473.

A. stans var. β Chois. Prodr. Hyper. 61.

A. Cubense Griseb. Plant. Cub. 40 (*Wright*, 2128).

Hypericum tetrapetalum Lam. Dict. iv. 153.

Georgia and Florida. Also in Cuba.

The specimens examined were from Florida (*Buckley*, *Palmer*, *Curtiss*, *Garber*), Georgia, and Cuba (*Wright*, 2128).

2. HYPERICUM Tourn., L. ST. JOHN'S-WORT.

Herbs or shrubs; with cymose yellow flowers; the sessile leaves

more or less pellucid-punctate and black-dotted: very variable in size of leaves, sepals, and flowers.—Gen. 902; Torr. & Gray, Fl. i. 157; Gray, Gen. Ill. i. 213, t. 92, 93; Benth. & Hook. Gen. Plant. i. 165, excl. *Elodea*. *Sarothra* L. Gen. 383. *Brathys*, *Brathydium*, *Myriandra*, *Roscyna*, and *Isophyllum* of Spach, Ann. Sci. Nat. 2. v. 367.—A genus of about 160 species, widely distributed, but chiefly of northern temperate regions; all but three of the 29 North American species restricted to the Atlantic U. S.

H. setosum L. Spec. 787, with the character only "floribus digynis, foliis linearibus," represents no plant known to Linnæus, but is a complex wholly founded on a phrase of Gronov. Fl. Virg., which belongs to *H. pilosum* Walt., and to one of Pluk. Alm., which is *H. nudicaule* Walt., whence the "digynis" and the suggestion of the specific name.

H. elatum Ait. Hort. Kew. iii. 104, proves to be *H. hircinum* L., or some nearly related Old World species.

H. triplinerve Vent. Hort. Cels. t. 58, must also be an Old World species, related to *H. hyssopifolium* L.

§ 1. Sepals and petals 4, or occasionally 5: stamens numerous, distinct styles 3, at first united into a long sharp beak, becoming distinct: capsule 1-celled, the placentæ projecting: branching shrubs.—*Isophyllum* Spach.

1. **H. microsepalum** GRAY. Decumbent or erect, half to a foot high or more: leaves very small, oblong-linear, 3 or 4 lines long, hardly a line wide, obtuse: flowers showy, about an inch in diameter, clustered at the summit of the branches: sepals slightly unequal, linear to oblong, mostly obtuse, much shorter than the somewhat unequal petals: capsule oblong-ovate, 2 to 3 lines long; seeds oblong, minutely striate and fitted.—Watson, Bibl. Index, Polypet. 456.

Isophyllum Drummondii Spach, Ann. Sci. Nat. 2. v. 367.

Ascyrum microsepalum Torr. & Gray, Fl. i. 157; Gray, Gen. Ill. i. 212; Chapm. Fl. 39.

Georgia and Florida.

This species is intermediate between Ascyrum and Hypericum, and Spach separated it from both by founding the genus Isophyllum. The habit, small and nearly equal sepals, and long beak-like styles, all belong to Hypericum, while the 4-merous flower associates it with Ascyrum. As the flowers are also sometimes 5-merous it seems most proper to consider it an outlying species of Hypericum.

§ 2. Stamens very numerous, distinct, or more or less united into sets.

* Styles 5, united below, distinct above: stigmas capitate: capsule 5-celled, the placentæ turned far back from the axis: tall perennial herbs with large leaves and flowers.

2. **H. Ascyron** L. Usually branching above, 2 to 5 feet high: leaves ovate-lanceolate, clasping, mostly acute, 2 to 5 inches long, about an inch wide, pellucid-punctate with elongated dots: flowers an inch or two in diameter, solitary at the ends of branches and in terminal cymes: sepals lanceolate to ovate, acute, 4 to 6 lines long: capsule ovoid-conical, 9 lines long; seeds terete, with slightly winged rhaphe.—Spec. 2 ed. 1102; Maxim. Pl. Nov. Asiat. iv. 162.

H. pyramidatum Ait. Hort. Kew. iii. 103; Torr. & Gray, Fl. i. 158; Gray, Manual, 84.

H. ascyroides Willd. Spec. iii. 1443; Chois. in DC. Prodr. i. 545, Hook. Fl. Bor.-Am. i. 109.

H. macrocarpum Michx. Fl. ii. 82.

From Canada to Vermont, Massachusetts, Connecticut, and E. Pennsylvania, westward to N. Illinois, Iowa, Michigan, Minnesota, the Winnipeg valley, and probably farther northwest. Also throughout northeastern Asia, and in Europe.

Our plant can not be distinguished in any way from the Asiatic, and was included with it in the original Linnæan description ("*Habitat in* Sibiria, Canada, Pyrenæis.") Maximowicz (l. c.) has called attention to the identity of the North American and Asiatic forms, and a careful comparison of specimens has fully confirmed his opinion.

** Styles united into a long, sharp beak, becoming distinct; stigmas minute, not capitate: more or less shrubby plants.

† Styles 5: capsule 5-celled: bushy shrubs with crowded leaves.

3. **H. Kalmianum** L. A foot or two high: leaves linear to oblanceolate, tapering at base, one or two inches long, 2 to 4 lines wide, pellucid-punctate with round dots, glaucous beneath: cymes few-flowered: sepals lanceolate to oval, half as long as the petals: capsule ovate, about 3 lines long; seeds abruptly and minutely pointed.—Spec. 783; Torr. Fl. N. Y. i. 86, t. 13; Torr. & Gray, Fl. i. 158.

Rocky shores, Canada, Niagara Falls, and about the Great Lakes.

†† Styles 3: capsule completely 3-celled: branching shrubs.

4. **H. Buckleyi** M. A. Curtiss. Low (half to a foot), widely branching from the base: leaves oblong, obtuse, narrowed at base, half to an inch long, 2 to 4 lines wide, paler beneath and more or less black dotted: flowers solitary and terminal, on long peduncles, sometimes in threes, about an inch in diameter: sepals obovate, not half as long as the petals: capsule conical, 4 to 5

lines long: seeds striate, with prominent rhaphe.—Am. Jour. Sci. 1. xliv. 80; Chapm. Fl. 39.

Cliffs, mountains of North Carolina and Georgia.

5. **H. prolificum** L. Leaves linear-lanceolate to narrowly oblong, narrowed at base, mostly obtuse and mucronulate, 1 to 3 inches long, 3 to 9 lines wide, with smaller ones in axillary fascicles: flowers numerous, half to an inch in diameter: sepals unequal, foliaceous, lanceolate to ovate, mucronate, much shorter than the petals: capsule lanceolate to ovate, 4 to 6 lines long; seeds striate.—Mant. 106; Chois. in DC. Prodr. i. 547; Torr. & Gray, Fl. i. 159, excl. var. γ.

H. rosmarinifolium Lam. Dict. iv. 159; Torr. & Gray, l. c.

Myriandra ledifolia Spach, Ann. Sci. Nat. 2. v. 365.

From New Jersey and District of Columbia, to Alabama, Arkansas, Missouri, Kentucky, Illinois, and Minnesota.

This species varies greatly in size, and in width of leaves, the southern forms often approaching the next species in appearance, but readily distinguished by the much larger and fewer capsules and flowers.

6. **H. densiflorum** PURSH. More shrubby and taller, sometimes 5 or 6 feet high, much more branching: leaves more crowded, narrower and shorter: flowers much more numerous and smaller: sepals smaller, not foliaceous: capsule 2 to 3 lines long.—Fl. 376; Chois. l. c.

H. galioides Pursh, 376, not Lam.

H. prolificum var.(?)γ Torr. & Gray, l. c.

H. prolificum var. *densiflorum* Gray, Manual, 84.

Myriandra spathulata Spach, l. c.

Pine barrens of New Jersey, to Florida, Tennessee, Arkansas, and Texas.

Large leaved forms from New Jersey (*Canby*) seem to intergrade with the last species, but the characters of capsules and flowers plainly indicate H. densiflorum. Between closely related species it is to be expected that intermediate forms will occur.

††† Styles 3: capsule 1-celled, or almost 3-celled by the projecting placentæ: shrubby at least at base.

‡ Placentæ projecting nearly to the center of the ovary.

= Sepals broad, ovate, foliaceous: flowers large and showy, solitary or in leafy cymes: leaves rather broad and somewhat coriaceous: shrubby.

7. **H. aureum** BARTRAM. Widely branched above, 2 to 4 feet high: leaves oblong, more or less attenuate at base, obtuse or acute, 1 to 3 inches long, 3 to 9 lines wide: flowers often solitary,

1 or 2 inches in diameter, very showy: sepals very unequal, often enclosing the capsule: petals orange-yellow, firm, reflexed: stamens excessively numerous: capsule ovate-conical, not lobed, 3 to 5 lines long.—Travels, 383; Torr. & Gray, Fl. i. 161.

H. frondosum Michx. Fl. ii. 81; Chois. in DC. Prodr. i. 544.
H. ascyroides var. *β* Poir. Suppl. iii. 694.
H. amœnum Pursh, 375; Nutt. Gen. ii. 10; Chois. l. c.
South Carolina and Georgia, to Tennessee, Alabama, and Texas.
Varies much in the size of its leaves and sepals, the mountain forms usually having smaller leaves.

8. **H. myrtifolium** LAM. More or less branching: leaves cordate-oblong, clasping, obtuse, half to an inch long, 3 to 6 lines wide, those of the cyme much smaller: flowers not an inch in diameter, in compound cymes: sepals resembling the leaves, larger than the floral bracts, often reflexed: capsule as in the last, but coriaceous and 3 or 4-lobed or angled.—Dict. iv. 180; Chois. l. c. 547; Torr. & Gray, l. c. 162.

H. glaucum Michx. Fl. ii. 78; Chois. l. c.
H. rosmarinifolium Chois. l. c., not Lam.
H. sessiliflorum Willd. Spreng. Syst. iii. 346; Torr. & Gray, l. c. 166.
From South Carolina to Florida and Alabama.

= = Sepals small, very narrow: flowers small, axillary and terminal: leaves narrow and much fascicled in the axils: shrubby and branching.

9. **H. fasciculatum** LAM. One to three feet high: leaves very narrowly linear and revolute, coriaceous, crowded, closely sessile, not tapering at base, usually with a line of large pellucid glands upon each revolute edge, 2 to 8 lines long: sepals resembling the leaves, shorter than the petals: capsule 3-lobed, oblong- to ovate-conical, few-seeded, a line or two long.—Dict. iv. 160; Chois. in DC. Prodr. i. 554; Torr. & Gray, Fl. 160.

H. nitidum Lam. l. c.
H. aspalathoides Willd. Spec. iii. 1451; Pursh, 376.
H. fasciculatum var. *aspalathoides* Torr. & Gray, l. c. 672.
Myriandra nitida, *brachyphylla*, and *galioides* of Spach.
Wet pine barrens, from North Carolina to Florida, Louisiana, and E. Texas.
Very variable in length and fasciculation of leaves. Lamarck's original specimen is our short-leaved form (var. *aspalathoides*), while his *H. nitidum* is a loose, long-leaved form, approaching some forms of the next species.

10. **H. galioides** LAM. Like the last, but leaves longer and broader, linear-lanceolate to oblanceolate, generally mucronate,

always tapering and subpetiolate at base, not so revolute, half to three inches long, as many lines wide: sepals linear-lanceolate, acute, tapering at base, shorter or longer than the petals.—Dict. iv. 161; Chois. l. c. 550; Torr. & Gray, Fl. i. 159.

H. axillare Lam. l. c. 160, not Michx.
H. fasciculatum Michx. Willd. Spec. iii. 1452, not Lam.
? *H. ambiguum* Elliott, ii. 30; Torr. & Gray, l. c. 162 and 673.
H. galioides var. *ambiguum* Chapm. Fl. 40.
Myriandra Michauxii Spach.

Wet ground, from Delaware to Georgia, E. Tennessee, and Louisiana.

These two species are inextricably connected by intermediate forms, and it is a question whether H. *galioides* should be considered more than a variety of *H. fasciculatum*. But the extreme forms are so remarkably different in appearance that for the present, at least, they are kept separate.

= = = Sepals small: flowers small, in naked cymes: leaves rather broad, thin and veiny: somewhat shrubby at base, a foot or two high, simple or branching.

11. **H. adpressum** Barton. Leaves linear-lanceolate to narrowly oblong, mostly acute, ascending, about two inches long, 3 to 4 lines wide, revolute, pellucid-punctate without black dots, translucently veiny: cymes leafy only at base, dichotomal flowers very short pedicelled: sepals linear to lanceolate, acute, half to two-thirds as long as the petals, often reflexed: capsule ovate to oblong, about 2 lines long; seeds oblong.—Fl. Philad. ii. 15; Torr. & Gray, Fl. i. 159.

H. Bonapartea Barton, Fl. N. Am. iii. 95, t. 106.
H. fastigiatum Elliott, ii. 31; Torr. & Gray, l. c. 166.
H. adpressum var. *fastigiatum*, Torr. & Gray, l. c. 673.

Moist ground, Nantucket to Rhode Island, New Jersey, Pennsylvania, and Georgia.

12. **H. cistifolium** Lam. Leaves ovate-lanceolate or oblong, obtuse, 2 or 3 inches long, half an inch wide, pellucid-punctate with very small crowded dots: cymes pedunculate, loosely-flowered, dichotomal flowers pedicelled: sepals variable, linear to oblong, about half as long as the petals: capsule ovate-conical, about 3 lines long; seeds cylindrical, with prominent rhaphe.—Dict. iv. 158, not of Torr. & Gray, Fl. i. 674, Chapm. Fl. 41, etc.

H. nudiflorum Michx. Willd. Spec. iii. 1456; Torr. & Gray, l. c. 162; Chapm. l. c.; Gray, Manual, 84.

From North Carolina through Georgia and Alabama to Texas.

As our *H. nudiflorum* has proved to be Lamarck's *H. cistifolium*, the latter name as applied in Watson's Bibliographical Index, p. 125, must disappear.

This leaves, as the oldest unoccupied name, *H. opacum* of Torrey & Gray, which accordingly reappears as a specific name.

‡‡ Placentæ projecting a little, or not at all: sepals unequal.

= Leaves mostly linear, with rather large and scattered pellucid dots: flowers in somewhat leafy-bracted cymes: capsule conical or globose; seeds large, oval, strongly rugose transversely.

13. **H. sphærocarpum** MICHX. Simple or branched, 1 to 3 feet high: leaves linear to narrowly oblong, mostly obtuse, 2 to 3 inches long, 3 to 6 lines wide: cyme loosely-flowered, dichotomal flower mostly sessile: sepals varying from small and linear to ovate and as long as the petals: capsule from depressed globose to ovoid, about 2 lines long; rhaphe almost winged.—Fl. ii. 78; Torr. & Gray, Fl. i. 163.

Rocky banks of the Ohio and its tributaries, southward to Arkansas.

This stands as a very good species, easily distinguished from any likely to be confounded with it, by its strictly one-celled capsule and large very rough seeds. In fact, the seeds are the most characteristic ones of the genus. By some mistake the specific name has been often written *H. sphærocarpon*, while the original name is as above.

14. **H. dolabriforme** VENT. Low, straggling, 6 to 18 inches high: leaves linear to linear-lanceolate, widely spreading, about an inch long, a line or two wide, mostly acute: cyme few-flowered, dichotomal flower pedicelled: sepals large and foliaceous, lanceolate to ovate, acute or acuminate, as long as the petals: capsule ovate-conical, almost triquetrous, about 3 lines long, coriaceous. —Hort. Cels. t. 45; Pursh, 378; Chois. in DC. Prodr. i. 547; Torr. & Gray, Fl. i. 162.

H. procumbens Desf. Willd. Spec. iii. 1450; Michx. Fl. ii. 81; Pursh, 379; Chois. l. c.

Dry hills, Kentucky and Tennessee.

= = Leaves oblong, obtuse: flowers in nearly naked cymes: capsule ovate; seeds oblong, minutely striate and pitted.

15. **H. opacum** TORR. & GRAY. One to four feet high: leaves linear oblong, about an inch long, 2 to 4 lines wide, closely sessile, pellucid-punctate with minute crowded dots: flowers 3 to 5 lines in diameter, in divaricate cymes, the dichotomal flowers mostly sessile: sepals oblong to obovate, about half as long as the bright yellow petals: capsule 2 to 3 lines long.—Fl. i. 163.

H. punctulosum Bertol. Bot. Misc. xiii. 18, t. 3, f. 2.
H. cistifolium Watson, Bibl. Index, Polypet. 125, not Lam.
South Carolina to Georgia, Florida, and Mississippi.

16. **H. ellipticum** HOOK. Mostly herbaceous, 10 to 20 inches high: leaves elliptical-oblong, sessile or tapering at base, ½ to 1½ inches long, 3 to 5 lines wide, pellucid-punctate with large scattered dots, translucently veiny: flowers 4 to 6 lines in diameter, in few-flowered cymes, the dichotomal flowers pedicelled: sepals mostly foliaceous and spreading, oblanceolate to narrowly obovate, usually shorter than the pale yellow petals: capsule as in the last.—Fl. Bor.-Am. i. 110; Torr. & Gray, Fl. i. 164.

H. sphærocarpum Barton, Fl. Philad. ii. 14, not Michx.

In moist ground, from Canada to Pennsylvania, westward to the Winnipeg valley.

Origin of the Flora of Indiana.

HARVEY THOMSON.

In an article of this nature it would not be advisable or necessary to enter into the details of the argument to prove that the original birthplace of our present flora is in the far north, near or even beyond the Arctic circle.

The origin of our present flora and the causes producing its present distribution present a rich field for thought and theory both to botanists and geologists, as the establishment of this theory of the northern origin of plants determines the temperature and climate of those regions in past geological periods. Many of the best thinkers of the botanical world have very ably discussed this subject in their writings. Noticeable among these are Dr. Asa Gray, Sir Joseph Hooker, Sir W. Dawson, De Candolle, Darwin, Wallace, Lesquereux, and others. Dr. Asa Gray first advanced his theory, before anything was known of the fossil life of the high northern latitudes, based upon the striking resemblances between eastern Asiatic and eastern American floras. The other writers have based their theories and conclusions upon the identity of many fossil plants, found in the cretaceous rocks of Greenland and the extreme northern part of the continent, with those of temperate latitudes of both America and Asia. These fossil plants were found by Dr. Lyall, Sir John Richardson and Sir Alexander Armstrong, and determined by Prof. Heer, of Zurich. There can, therefore, be no doubt as to the identity of these plants and, consequently, as to the origin of our temperate flora or the climate of those regions in the periods preceding the tertiary, as it is conceded that plants become acclimatized very slowly, if ever. During the glacial epoch these plants

must have been pushed much farther south than Indiana, as the glaciers themselves reached its southern border. The plants of Indiana have then stopped on their return journey from the south, during the epochs immediately succeeding the glacial, because they here found their original and natural climate and surroundings. Of course there may have been several minor countermarches included in this general movement to the south and return, but these would not affect the general fact of the movement in the least. The physical geography of Indiana gives it an extremely variegated and abundant flora, from the high "knobs" of the Ohio valley on the south to the low swamps and tamarack groves of the lake regions of the north. This flora is also receiving continual additions from the railways and streams which traverse it or extend along its borders.

In the table below I have attempted to give, in the first column, the direction from this state in which the plants seem to be most abundant and most widely distributed; in the second the proportion of these which have the limit of their range in Indiana or some immediately adjoining state; in the third the proportion which go beyond this limit; in the fourth the proportion of the plants of each direction relatively to all those of the state; and in the last the number from each direction.

Direction.	Limited by Ind.	Extending beyond Ind.	Proportion of No. in State.	No. in State.
SOUTHEAST	72 per ct.	28 per cent.	about 23. p. ct.	274
All along the eastern coast from Canada to Florida and westward	52 " "	48 " "	" 17.9 "	213
NORTH	54 " "	46 " "	" 15.5 "	184
EAST	53 " "	47 " "	" 12.9 "	154
NORTHEAST	41 " "	59 " "	" 12.3 "	147
Common to all N. A. or at least to all U. S. and far northward	. . . .	. . . .	" 8.2 "	98
Local, or limited by immediately adjacent states	. . . .	. . . .	" 3.2 "	38
SOUTH	77 " "	23 " "	" 2.2 "	26
Along the Mississippi river	. . . .	. . . .	" 1.7 "	20
NORTHWEST	21 " "	79 " "	" 1.6 "	19
SOUTHWEST	89 " "	11 " "	" 1.5 "	18
Total number of plants in the state	. . . .	. . . .	. . . .	1191

To this total number should be added a few more which have been found in the state since this list was made, in order to get the full number in the state at present. In this list all plants of European origin, or which have escaped from cultivation, have been omitted.

The fact that a little more than four-fifths of our plants have

a range extending north and east of our state, and that those south and southeast are found mostly on mountains, proves that the temperature of the arctic regions, where our flora originated, was some cooler during the cretaceous period than that of Indiana at present. As the same laws which now produce the warm equatorial current from the southwest prevailed during the tertiary period, no doubt the same difference in temperature between the eastern and western coasts of America existed then and extended much farther inland, owing to the absence of such high mountain ranges to break the force of the warm current. During the Champlain epoch, therefore, when these plants were seeking to escape the heat, they moved in an easterly as well as northerly direction.

It will be noticed that a much larger proportion of those plants belonging to the south southwest and southeast is limited by Indiana than of those from the north. This is caused by the natural barrier to northern progress presented by the Great Lakes and also by the fact that any plants remaining in or reaching the Mississippi valley will be very liable to be borne south by its river currents, so that a plant which is most abundant in the north may be found scattered along the banks of the Mississippi as far south as climate will permit its growth.

The Polypetalæ, Gamopetalæ and Monocotyledons have near the same proportions in the different directions and about that given in the table for all; while the Apetalæ, of which there are only one hundred and thirteen in Indiana, have 32% of their number southeast and the next largest number east—which in the table means along the eastern coast, but not so far north as Canada or south as Florida.

Among the Polypetalæ the Leguminosæ have the largest number in the southeast and next along the eastern coast from Canada to Florida, while the Rosaceæ are most abundant north and along the eastern coast respectively.

The Compositæ among Gamopetalæ have the largest number southeast, while those along the eastern coast are about as numerous.

Among Monocotyledons, however, the Cyperaceæ and the Gramineæ especially have a very large proportion common to all North America, or at least to the United States and far north into British America. Perhaps the mode of growth and reproduction of these families will partially account for their wide distribution.

BRIEFER ARTICLES.

Primula Cusickiana Gray.—I have just received from Mr. E. M. Salt, of Boisé City, Idaho, living specimens of this species collected near that place. Heretofore it has been reported only from Union county, E. Oregon, by Mr. W. E. Cusick, in whose honor the specific name was given. The "whitish line down from the sinuses" of the calyx tube is the white mealiness so common in P. farinosa, and is very apt to disappear in older or much handled specimens. Of course this mealiness often leaves a bleached out line which may persist or not. Mr. Salt says that the plant had been blooming since the middle of February.—J. M. COULTER.

Bentham on citation of authorities.—Referring to our editorial on the citation of authorities we are asked to give the other side of the question by reprinting some remarks by Bentham in the *Journal* of the Linnean Society, xvii (1878). p. 190. Although willing to conform to usage, we fail to see that this affects our position in the least.—EDS.

Besides the young liberal-minded botanists who scorn to submit to any rule but their own, there are others who differ materially in their interpretation of some of the laws, or who do not perceive that in following too strictly their letter instead of their spirit they are only adding needlessly to the general disorder. In the application as well as in the interpretation of these rules they do not sufficiently bear in mind two general principles: first, that the object of the Linnæan nomenclature is the ready identification of species, genera, or other groups for study or reference, not the glorification of botanists; and, secondly, that changing an established name is very different from giving a name to a new plant.

Although much credit may be due to the collector or botanist who has discovered or distinguished really new species (and it is but fair that their discovery should be commemorated), yet it is only second-rate botanists who pride themselves on the number of names, good or bad, to which their initials can be attached. In all cases, therefore, when the object is only to speak of a plant as in catalogues, references, physiological treatises, or even local floras, for practical use one can not attend too closely to the observations of DeCandolle and say *Matthiola tristis*, or *Matthiola tristis Br.*, without any additions (such as *Linn., sub Hesperide*), explanatory of the history of the name. Such a history, absolutely necessary in a full monograph, for instance, should always be considered as belonging to the description and history of the species, not as forming part of its name. It is also with sincere regret that we see distinguished botanists endeavoring to combine rejected with adopted names by the obviously false nomenclature exemplified in *Matthiola tristis* Linn.

There is one practice which has grown up of late years, adding largely to the number of useless synonyms, against which I can not refrain from taking this opportunity of entering a strong protest. I mean that of creating a new name in order to combine an old specific with a new generic one. In ferns, the wanton multiplication of ill-defined, or undefinable genera, according to the varied fancies of special botanists, has had the effect of placing the same species successively in several, some times seven or eight, different genera; and it is proposed to maintain for the specific appellation the right of priority, not in the genus alone in which it is placed, but in the whole of the genera to which, rightly or wrongly, it has been referred. This has been carried to such a degree as to give to the specific name a general substantive aspect, as if the generic ones were adjuncts—a serious encroachment on the beautiful simplicity of the Linnæan nomenclature; and it is to be feared that there is a tendency in that direction in phænogamic botany. When a botanist dismembers an old

genus, rule 57 requires that he should strictly preserve the old specific names in his new genera; and when he has wantonly and knowingly neglected this rule, it may be right to correct him. But when a botanist has established what he believes to be a new species, and has therefore given it a new name, the changing this name after it has got into general circulation, because it has been discovered that some other botanist had previously published it in a wrong genus, is only adding a synonym without any advantage whatever, and is not even restoring an old name; for the specific adjective is not of itself the name of a plant. A generic name is sufficiently indicated by one substantive, for no two genera in the vegetable kingdom are allowed to have the same name; but for a species the combination of the substantive and the adjective is absolutely necessary, the two-worded specific name is one and indivisible; and the combining the substantive of one name with the adjective of another is not preserving either of them, but creates an absolutely new name, which ought not to stand unless the previous ones were vicious in themselves, or preoccupied, or referred to a wrong genus. It is probably from not perceiving the difference between making and changing a name that the practice objected to has been adopted by some of the first among recent botanists, such as Weddell, though under protest.

Thalictrum.—It is desirable that attention be given to our polygamo-dioecious species of this genus, namely, T. purpurascens and T. Cornuti of the Manual, and I shall be grateful for specimens throwing additional light on them. After carefully working over the material in the Gray, Torrey and Lapham herbaria, together with the numerous specimens in the duplicate collection of the late Charles Wright—now in the hands of Dr. Goodale—I should characterize these species as follows:

T. PURPURASCENS Linn.—Stem stout and tall, green or mostly purple, leafy: leaves ample, 3-4-ternate, the lowest petioled: leaflets as much as 2 in. long, short-stalked, firm, the upper surface dark-green, mostly oblong or oblong-cuneate with three entire pointed lobes above: flowers nearly dioecious (very rarely with a few stamens when fertile), purplish, in a loose leafy panicle: stamens numerous, their long and spreading filaments widening to the linear-oblong cuspidate anthers, which are 2-3 mm. long: achenia densely clustered, 3 mm. long, ovoid-acuminate with mostly eight sharp longitudinal wings, those at the sutures most prominent, thin-walled, tapering into the slender persistent style. —Canada to Florida and Texas; west to Arizona, Montana and Saskatchewan.

Varies from glabrous or granular to pubescent or glandular-pubescent on the lower surface of the leaves, etc. When conspicuously glandular-pubescent it is *T. graveolens* Muhl., in Fl. Lancast. *Mss.*, which is the variety *ceriferum* Austin, of the Manual. Veiny and with strongly revolute margins it is *T. revolutum* DC.; with pubescent achenia it is *T. dasycarpum* Fisch. Mey. & Lall., which commonly approaches the next species in having anthers scarcely 2 mm. long and papillately-roughened filaments occasionally equalling the anthers in width and involute when dry. A form with thin leaves (scarcely thicker than in dioicum) and very long slender stigmas is *T. macrostigma* Torrey *ined.*, from Louisiana (*Hale*) and Indian Territory (*Palmer*); which appears to be partly connected with the type by shorter-styled Arizona specimens collected by *Rusby*.

T. POLYGAMUM Muhl. (*T. Cornuti* of the Manual).—Of the general appearance of the last but often less purple and with smaller leaves and leaflets: flowers most commonly polygamo-dioecious, more corymbosely clustered at the

ends of the nearly naked branches of the panicle, more conspicuous in the male plants from the shorter crowded erect stamens: filaments white, broader than the oval blunt (or rarely short mucronate) anthers and involute when dry, appearing then clavate and rugose: achenia mostly narrower and more stipitate.—New Brunswick to Florida and Louisiana; west to Ohio, but mostly confined to the Atlantic States.

Glabrous or pubescent, but not glandular. When conspicuously downy it is *T. pubescens* Nutt. The achenia are rarely pubescent.

So far as I have been able to observe, glandular and non-glandular trichomes never occur on the same plant, nor have I seen any glandular specimens with the characteristic stamens of T. polygamum, so that the presence of glands appears to be characteristic of T. purpurascens, so far as these two species are concerned. Where no stamens occur it is impossible to identify fertile plants with certainty unless this character can be utilized, and it must then be used only as a positive character, since glabrous or pubescent forms occur in both species. In T. purpurascens a variety can not conveniently be based on it, for several other species of the genus (e. g. T. sparsiflorum) include both glabrous and glandular forms, not separable by associated characters. No good reason exists for separating T. purpurascens into two species (revolutum and dasycarpum) as has been done by Lecoyer;* nor, in the opinion of Dr. Gray, is there sufficient doubt as to the plant intended by Linnæus to warrant the rejection of his name in this instance, though this is necessary in the case of T. polygamum.

Specimens occur both in the north and south which resemble T. dioicum in having very thin glabrous (rarely sparingly pubescent) pale leaflets rounded and with 7 to 9 round lobes at the apex, but with the fruit, as in these species, *i. e.*, thin-walled, stipitate, 2-edged and wing-nerved (not subsessile, thick-walled, terete and deeply and evenly grooved). It is doubtful whether these forms should not be regarded as hybrids, and cases of the simultaneous flowering of T. dioicum and either of the late species should be noted.—Wm. Trelease.

The Brothers Tulasne.—It is but a few months since the botanical journals announced the death of Charles Tulasne at Hyeres in the south of France, on August 21, 1884, and we are now called to mourn the death of his elder brother, Louis René Tulasne, who died at Hyeres on December 22, 1885. In their lives and botanical work the two brothers were so intimately associated that botanists have almost come to use the name Tulasne as representing a single person. They were so modest and reticent with regard to themselves that few details of their lives could be learned even by their associates. The older brother, Louis René, was born at Azay-le-Rideau, Indre-et-Loire, September 12, 1815, and studied law at Paris. His first botanical work was in connection with Auguste St. Hilaire in the preparation of his flora of Brazil. In 1842 he was appointed aide-naturaliste at the museum of the Jardin des Plantes, and, in 1854, he was elected to the Academy as the successor of Adrien de Jussieu. About 1864 his health failed and he was obliged to retire from active service at the museum. His brother Charles was born at Langeais, Indre-et-Loire,

* Monogr. du genre Thalictrum, Gand. 1885.

September 5, 1816, and began the practice of medicine in Paris in 1843. Soon after the withdrawal of Louis from active life the two brothers removed to Hyeres on the Mediterranean, where they passed the remainder of their lives in seclusion, absorbed in the service of the Roman Catholic Church of which they had always been most devout followers.

From a letter written by Dr. Vidal to the President of the Academy at Paris, we learn that, on December 22, M. L. R. Tulasne, who appeared to be in good health, accompanied a friend for a part of the way from his own residence to Hyeres, but on his return he was suddenly seized with an apoplectic fit and remained unconscious until his death at 4 P. M. The following extract from Dr. Vidal's letter expresses the esteem in which M. Tulasne was held by his neighbors: "You will have at Paris all the information regarding his scientific work; but what will never be known is the amount of good which he did to those about him. M. Tulasne lived very retired in the country; he received all persons with the same affability, but one saw that, to interest him actively, it was necessary to point out to him those who were unfortunate and in need of consolation, and then his goodness and charity were equally inexhaustible. Aided by his brother, Dr. Tulasne, who died last year, he established charitable institutions pretty nearly everywhere in this region. His life so well spent may be summed up by saying that he did good, nothing but good and always good."

In their botanical works the illustrations were generally made by Charles, while the text was written by Louis, although, in a number of cases, the text was the joint work of both. Of the fifty titles given under their names in the Royal Society's Catalogue, eleven bear the names of both brothers. Their active work began with "Observations sur le genre *Elaphomyces*," in the Annales des Sciences of 1841, and their latest work was probably the paper on *Tremellini* in the Annales of 1872. Of their contributions to phænogamic botany the most important were monographs of the *Podostemaceæ* and *Monimiaceæ* in the Archives du Museum, some articles on *Leguminosæ*, and an account of Madagascar plants, all showing careful and accurate work in descriptive botany, while the "Etude d'embryologie végétale," in the Annales of 1847, showed their ability in a very different and difficult field.

But it is in connection with their work on the structure and development of fungi that they are best known and, in this department of botany, their writings, we might almost say, form the basis of modern views on the subject. As in most all cases Charles furnished the illustrations and, at times, also a portion of the text, we need not distinguish between the two brothers in speaking of their mycological works. Their attention was, at first, directed to hypogæous fungi, and from them it naturally turned to the structure of *Gasteromycetes*, an order which was in a chaotic condition at that time. The structure and affinities of the principal genera of this order formed the subject of several of their papers. The *Ustilagineæ* and *Uredineæ* were treated in two important papers, "Mémoire sur les Ustilaginées comparées aux Urédinées," in the Annales of 1847, and "Second Mémoire sur les Urédinées et les Ustilaginées," in 1854. In these two admirable papers, to a knowledge of the anatomy there was added a study of the germination and development of the spores in the different genera

with the result of showing clearly the relations of the uredo- and teleutosporic forms, and affording a proper basis of classification of the two orders.

The metamorphoses of *Pyrenomycetes* gave rise to a number of papers in which the connection of secondary forms as conidia, pycnidia, spermogonia, with ascosporic forms was clearly shown. On this fruitful topic, the superb illustrations have been the envy of all later botanists, and their observations on the development of ascomycetous fungi threw a flood of light on one of the most obscure corners of mycology. In this connection should be mentioned the memoir on ergot and also the "Mémoire pour servir á l'histoire organographique et physiologique des lichens" in the Annales of 1852, one of the most important treatises on the structure of lichens.

The complete studies of the Tulasnes on hypogæous forms appeared in 1851, when they published a folio volume, "Fungi Hypogæi," of which only a hundred copies were printed. This work was followed in 1861–65 by the "Selecta Fungorum Carpologia" in three volumes, containing an elaborate account of the different conditions of *Erysiphei*, *Pyrenomycetes*, and all other ascomycetous fungi. These four volumes, which really form a single series, are most elaborately and luxuriously printed and illustrated, and are certainly unequalled, artistically considered, by any other work on fungi. They will remain a lasting monument to the memory of these two men, who were as talented as they were modest. Always courteous to their contemporaries and quick to recognize the value of their work and that of their predecessors, it is not strange that they were universally esteemed. Their lives seem almost a romance from the time when they began their botanical career as young men at Paris to their death at one of the most beautiful spots on the Mediterranean. The spirit which guided them through life and inspired them in their scientific work is indicated in the quotation which is placed at the head of the beautiful plates of the last volume of the Carpologia: "Non nobis, Domine, non nobis sed Nomini Tuo da gloriam."—W. G. FARLOW.

The Grasses of Coulter's Manual.—In his preface the author invites criticisms or corrections with the view of hastening the production of a second edition, and the remarks here offered are made with the hope that they may be of some use in the direction indicated. Being more intimately acquainted with the order Gramineæ than with the other families, these notes will be confined to this order.

The sequence of the genera of grasses is in accordance with that of Bentham and Hooker's *Genera Plantarum*, and we have here the first attempt at introducing into an American text-book that nomenclature of the parts connected with the flowers, as adopted by Bentham, designed to express their true morphological relations. The term glume is applied not only to the two lower bracts that embrace or subtend the spikelets, but also to the bract that subtends the flower which, in other American text-books, is termed the lower palet or palea. The latter term (palea) is applied only to the "upper palea" of authors, the real character of which has never been clearly demonstrated. Bentham suggested that this palea with the lodicules might represent perianth segments of an outer and inner series which, if confirmed, would justify our designating as a neutral flower that in which the palea alone or the palea and lodicules without stamens or pistils are developed; but we must not include in the flower the bract or glume which subtends it.[1]

[1] Bentham, Notes on Gramineæ, Trans. Linn. Soc. xix., p. 24.

In characterizing the order, p. 397, the author has failed to present clearly this modification of terms by adhering too closely to the characters given in Gray's Manual. The same may be said in reference to the specific descriptions. In describing Panicum capillare he says, "sterile flower neutral and of a single glume." A glume in no way constitutes a "flower," and in order to conform with the nomenclature generally adopted, the expression should be "third glume empty," *i. e.*, devoid of a palea or any of the essential organs. In the same description he calls the 2d glume the "upper one," and the 4th or flowering glume he calls a "*somewhat obtuse perfect flower.*" In describing Stipa spartea he says the glumes, meaning the two empty ones, are longer than the "palets." One of these "palets" is called a "flowering glume" in the characterizing the genus on p. 399. Again, under Stipa viridula, he speaks of the "lower palet." There are other instances of lack of uniformity in the use of terms employed to designate the parts of a spikelet, but it is not necessary to refer to them, as our purpose is merely to call attention to this matter. In this connection it may be well to suggest that the expression "outer glumes," although admissible in many cases and sufficiently exact, may lead to inaccuracies or confusion if too generally used. It is understood to refer to the two lowest or the first and second glumes of the spikelet when these alone are empty glumes. When the structure of the spikelet will permit its use in this sense there may be no objection in using it, but in other cases it would be better to designate the glumes by number, as 1st, 2d, 3d, etc. In Reimaria, Leersia, Zizania, etc., there are only two glumes in the spikelet, and, of course, both are "outer" glumes, in a literal sense, but one of them is a flowering glume. In such cases it would hardly be correct to say that there was but one "outer" glume. On the other hand in Panicum, and a number of other genera, there are often three empty glumes below the flowering one. Here the use of the expression in question would lead to needless complication.

In the synopsis of genera, page 398, there are a few errors of fact or misuse of terms that call for a revision. Beckmannia is said to have three empty glumes and a flowering glume. In the European plant there are four glumes, the two lower ones empty while the third and fourth are flower-bearing, or the third may enclose only palea. In the American plant, so far as it has been examined, only three glumes have been discovered—the two lower ones empty, the third enclosing a perfect flower.

The genus Panicum is described as having only three glumes, two empty and one "fertile." Now, the most important character in distinguishing Panicum from Paspalum is the fact that in the spikelets of the former there are *four* glumes while the latter has but three. The same error occurs in describing Setaria, which in the number and character of its glumes are the same as in Panicum. We have here also the expression "the flowering glume with its *palets*." This may have been an oversight in correcting the proofs. The flowering glume in the Andropogoneæ is said to be "often bearded." It is often *awned* but never bearded. The flower in the genus Phalaris is stated to "consist of two glumes, sometimes called palets." There are no true paleæ in Phalaris, and it is hardly necessary to say that the stamens and pistil constitute the flower, and that the glumes are only bracts subtending it. In Phalaris there are five, or more often six glumes; two large, complicate outer ones, two smaller inner ones enclosing the flower and two (sometimes only one) intermediate ones which are small and lanceolate or are reduced to simple bristles.

In the synopsis, Agrostis and Cinna are separated from Deyeuxia by having "no bristle standing opposite the palet." In Cinna pendula, the only species described, the rhachilla is very often prolonged behind the palea into a short, naked bristle, and in *Agrostis humilis* Vasey, a well marked species found in Colorado, Montana, etc., there is a similar extension of the rhachilla.

No one would look for *Graphephorum flexuosum* Thurb. in Graphephorum as characterized on page 402, where it says "outer glumes nearly equaling the rather remote flowers." In G. flexuosum the outer glumes are one-half shorter

than the spikelet and the florets are usually crowded. In a former number of the GAZETTE (vol. ix. p. 169) it was stated that this grass constituted a good genus by itself distinct from Colpodium and Fluminia and still farther removed from Graphephorum melicoides. Its true relationship is somewhat obscure, but there can be no hesitation in placing it with the Festuceæ. As to Graphephorum melicoides and Wolfii, their affinities are with the Aveneæ. The former was first published under Aira and the latter under Trisetum.[1] They differ from Trisetum only in the less pointed lobes of the flowering glumes and in the shorter awns. Graphephorum melicoides, usually described as awnless, is sometimes short awned like G. Wolfii. So closely allied are these two species, that slender forms of the latter might easily be mistaken for the former. That this mistake has occurred is evident from the fact that Utah and Wyoming are given in the range of G. melicoides, where only G. Wolfii has, as yet, been found.

On page 403 *Panicum amarum* Ell. is described. It is exceedingly doubtful if this plant has ever been found in the interior.

Setaria setosa, var. *caudata* Vasey, should read *S. setosa*, var. *caudata* Griseb. (See Griseb. Flor. Br. W. Ind. p. 555.)

Andropogon furcatus Muhl. has an older synonym, *A. provincialis* Lam. (See Scribner, in Trans. Kansas Acad. Sci. ix. p. 116.) *A. Hallii* Hackl. Sitzb. der k. Akad. d. Wissensch, Band lxxxix. p. 127) is not an infrequent species in the Rocky Mt. region from Arizona to Montana. It is No. 651 Hall & Harbour.

Muhlenbergia sylvatica, var. *setiglumis* Watson (p. 409) is *M. ambigua*, Torr. in Niccolet's Rept. p. 164.

Vilfa cuspidata Torr. and *depauperata* Torr. were first placed in Sporobolus by Scribner. (See Bull. Torr. Bot. Club, ix. No. 8.)

Aira flexuosa Linn. is *Deschampsia flexuosa* Griseb. (Spic. ii. p. 457), and not of Beauvois.

In placing *Aira latifolia* Hook. in Deschampsia, a new specific name must be given, as *latifolia* is already taken. It should be called *D. Hookeriana*.

Munro never named any Poa, *P. Californica*. He did have a *Sclerochloa Californica*, which is abundantly distinct from the *Poa Andina* of Nuttall.

Buckley should be quoted as the author of *Poa tenuifolia* (see Proc. Acad. Phila., 1862).

Poa arctica (on page 422) is *P. leptocoma* Trin. *Poa arctica* Br. is *P. cnesia* All.

Bromus breviaristatus should be given to Buckley, who published the species under that name in 1862, twelve years before Thurber's publication.—F. LAMSON SCRIBNER.

EDITORIAL.

THE CUSTOM, which happily is now quite general among botanical writers, at least in America, of distributing separate copies or "extras" of articles published in periodicals, reports of societies, etc., is one especially to be commended. It is mutually helpful to the author and the recipient, and places the publications directly in the hands of those who can make the best use of them, irrespective of the circulation of the medium through which first issued. It is evidently desirable that the excerpt should furnish the possessor with all the data necessary to make a proper citation from it, the same as if the volume in which it was first published were consulted. For this reason it is essential that the original paging should not be changed, and that it should bear the name

[1] Bot. Gaz., ix. 168.

of the publication from which it is taken, together with the number of the volume and the date. These items are not infrequently overlooked, and the excerpt is accordingly shorn of an important part of its usefulness. But it often happens that the author in his distribution does not send a copy to some one who is interested in the subject, and who for various reasons would be glad to possess one. In this country almost the only course open to him is to apply directly to the author for it. In Germany he would usually have no difficulty in purchasing a copy for a small sum of some one of the numerous second-hand bookstores. We on this side of the Atlantic may now and then buy "extras" from the dealers in Berlin and Leipzig of the writings of Dr. Gray, Dr. Farlow, and other American authors, but we must pay for the journey they have taken. An American dealer having the confidence of both the authors and the purchasing public, who would take pains to gather up such papers as we have been speaking of, and offer them at reasonable rates by means of classified lists, would merit the gratitude of scientists, and we do not doubt would meet with pecuniary success. Then the modest author would feel certain that a demand indicated a real interest in his writings, and the modest purchaser, who lacked the temerity to solicit the article from the writer of it, could still supply his needs.

OPEN LETTERS.

Nasturtium lacustre Gray.

The upper leaves of *Nasturtium lacustre* detach themselves when fully matured and emit roots and a stem from the lower extremity. I have seen quantities of such young leaf-plants floating in deep rivers. I do not find this fact recorded.

L. H. BAILEY, JR.

Agricultural College, Mich.

A double Orange.

My attention has been lately called to an interesting variety of orange which has been for sale in this market, said to have come from California. The fruit is about the size of a medium orange, with a slight swelling at the upper end. Dissection reveals a small orange almost completely enclosed in the skin of the large one. The core runs from the stem to about the center of the fruit, and is of about normal size. Then it expands, and for half of the remaining distance is more than twice its previous size. At this point is situated the small orange. This is composed of from seven to eight segments arranged as in the main orange. No seeds are found in the fruit, and it is sweet and juicy. This duplication of fruits was observed not in one orange alone, but in a whole box, and perhaps exists in more. At the upper or flower end of the fruit the skin does not wholly inclose the pulp, but exposes the segments of the smaller orange.

JOS. F. JAMES.

Cincinnati, Ohio.

Arrangement of Herbarium.

I take out and put back the sheets of my grasses many times in the course of a month. My own collection of genera is arranged alphabetically; that of the college herbarium according to Bentham and Hooker's Genera Plantarum. The alphabetical list is much the handiest to use. I shall soon arrange the species of grasses in each genus alphabetically. I shall be glad to hear the views of others on this subject, especially of those who have tried both ways.

Agricultural College, Mich. W. J. BEAL.

Tamarack in Indiana.

Since writing my paper on the "Origin of the Flora of Indiana," I have received through Prof. Coulter a specimen of wood from Johnson county, in the southern part of this state, which proved to be Larix Americana. This wood was found buried in the blue clay underlying the glacial drift, and had been so well preserved that one would easily distinguish it as a conifer at sight, while its tissue structure was readily recognized as that of L. Americana. I have also heard of other cases in which pieces apparently of the same species have been found in various similar situations throughout the southern part of the state. Now we have only a very few in exceedingly favorable places in extreme northern counties. Prof. Heer found at least some of its near congeners among the specimens from the cretaceous rocks of Arctic North America. These facts help confirm the conclusion that our flora originated in the far north, was driven south during the glacial period and again north during subsequent periods, and distributed as we now find it. H. THOMSON.

Crawfordsville, Ind.

The Fertilization of Campanula Americana.

In a paper under this title read before the A. A. A. S., and published in this journal (Vol. x. p. 349), I described the introversion of the hairs on the style, and referred to Strasburger's confirmatory account of C. rapunculoides, in which, however, he gives no indication that the matter had previously been worked out in another species. My attention has been called to a paper by W. Wilson, entitled "Further remarks on the pollen-collectors of Campanula," etc., in Hooker's *Journal of Botany*, vii (1848). 92. Respecting C. rotundifolia Mr. Wilson says: "The hairs . . . . are simply *pollen-collectors*, and nothing more; they discharge this function admirably; and having performed it they retire, each within its own cell, by virtue, I suppose, of some action of exosmosis. . . . . The whole of the exserted hair is retracted into its base which forms an embedded cavity in the substance of the style." While this matter is only incidentally mentioned in my paper, it is proper that credit be given to Wilson for an observation far antedating Strasburger's and mine. Thus do we, for lack of knowing what has been done, grind over and over the same grist. C. R. BARNES.

Cambridge, Mass.

CURRENT LITERATURE.

Report of the Botanist to the New York Agricultural Experiment Station. By J. C. Arthur. Extracted from the third annual report for 1884, pp. 353-385, and from fourth annual report for 1885, pp. 241-265. 8°.

Professor Arthur was appointed botanist to the New York Agricultural Experiment Station in March, 1884. These two reports embrace the results of his investigations for the years 1884 and 1885. These have been mostly confined to the investigation of fungous diseases, and especially those of cultivated plants. The great importance of this line of study is evident to all who know anything of the magnitude of the losses incurred by fungous parasites. Four introductory pages of the first report are occupied with a statement of the nature and habits of fungi, following which are the details of various experiments with several injurious species. The list of investigations includes diseases of the pear, apple, quince, peach, tomato, oats, and other plants of the field and garden. The investigations upon the pear blight appropriately take a leading place in both reports, and as this work has been of such importance as to attract the notice of the general press of the country, it is only necessary to here state that the cause of pear blight has been demonstrated to the satisfaction of

those who are most familiar with the subject. This destructive blight is due to *Micrococcus amylovorus* B., a bacterium discovered by Professor Burrill a few years ago, in connection with pear and apple blight. The minute germs find entrance to the tree through the tender surfaces of flowers and young twigs in spring time and then multiply, producing the familiar burned appearance of the leaves and twigs in mid-summer. By a careful filtration of the juices accompanying the bacteria, and by a long series of cultures in the usual way for the elimination of all foreign matter, it was demonstrated that the cause of the blight resides with the bacterium germ and not in the enveloping liquid. It was a happy thought that led to the innoculation of the very susceptible flesh of the growing fruit, and it serves as a hint to all investigators that they should seek for every possible advantage in applying their tests. It remains for the fungicide to be found. If some otherwise harmless chemical will prove effective, it seems that with this additional discovery the work of the scientists in this case would be fairly completed. Until such remedy is found the old one of the knife used upon all discolored branches should be vigorously applied. The blight of the apple and quince are of the same origin and require the same treatment.

Professor Arthur has made observations on another blight or scab, *Fusicladium pyrinum* Fckl., that works upon the leaf of the pear. Another species of the same genus, *F. dendriticum* Fckl., works in like manner upon the apple leaves covering them with rusty spots, and upon the fruit, sometimes causing much damage.

The amount of smutted grain in an ordinary field of oats was carefully determined to be nine and one-half per cent. This strikingly points to the fact that doubtless the loss of grain from smut is greater than generally supposed. Much of the smutted grain is overlooked by the ordinary observer.

The lettuce rust and mildew have both been subjects of investigation, and both are illustrated with engravings. The rust, *Septoria Lactucæ* Pass., causes the lettuce leaves to turn brown and become unfit for use. Experiments with fungicide as yet have developed no satisfactory remedy. The mildew, *Peronospora gangliformis* DeB., is a genuine rot and a close relative of the potato rot. The wild lettuce is a natural propagating bed for this disease and should be eradicated wherever found.

Extensive investigations have been made upon the rotting of cherries and plums, caused by *Oidium fructigenum* S. & K. This fungus passes the winter in decayed fruits that frequently remain hanging to the trees. Sowings of the fungus spores upon the flowers of cherries quickly produced the rot in the young fruits. The disease spreads rapidly from fruit to fruit when the latter are in contact, and there is little doubt that the mycelium has the power of penetrating the fruit skin, though some writers hold that they can only pass through stomata, or ruptures in the fruit. It has been stated by Von Thümen and others that this fungus acts as an antiseptic. This impression may arise from the fact that when it has coated the surface of a fruit, it excludes the entrance of more active putrefying germs, as those of bacteria. Professor Arthur's experiments lead him to as extreme a view of the case as the following, which we give in his own words: "Doubtless such destructive species as the Peronosporæ of potato-rot and lettuce-rot are not the direct cause of the offensive putrefaction, but it is due to the bacteria associated with them. We very properly hold the higher fungus accountable for the result, however, for it first produces by its growth those chemical products upon which the bacteria are able to thrive. . . . . The inability of the usual putrefactive bacteria to overcome the resistance of the living cells and start decay, has been well illustrated by numerous experiments performed in connection with other topics, and particularly by the ineffectual inoculation of green tomatoes with bacteria taken from a rotting fruit in which were only bacteria and fungous mycelium." The remedy suggested for the serious rotting of fruits is the destruction of all decaying fruit, whenever and wherever found. When practicable hogs should run under the trees.

In *Entomophthora Phytonomi* Arthur we have a new species of fungus that is welcomed to a place among those forms preying upon destructive insects, and are therefore friends of the farmer and gardener. This fungus, the life history of which, as far as known, is described and illustrated in the report, infests the bodies of the clover-leaf weevil (*Phytonomus punctatus* Fabr.), causing the host insects to die. The behavior of the ravaged weevils and the methods of dispersing the spores of the fungus are particularly interesting.

In conclusion, Professor Arthur tabulates the weeds and the number of each which grew upon one-twentieth of an acre of plowed and otherwise unoccupied land during 1885. To this subject is added notes upon some of the fungi that prey upon weeds—a list of friends, when they confine themselves to undesirable hosts, as the Canada thistle, pig-weed and purslane. We hope to see an annual contribution to our limited fund of knowledge of plant diseases from Professor Arthur for many years to come. Many of his subjects demand continuous investigation through several seasons. BYRON D. HALSTED.

Text-Book of General Botany. By Dr. W. J. Behrens. Translated fromt he 2d German edition. Revised by Patrick Geddes. 8°, pp. viii, 374. Edinburgh: Young J. Pentland. 1885.

Germany has produced many text-books of botany, of all grades of excellence, and several of them have been honored by an English translation. We are more than willing to acknowledge Germany's leading position in botany, but why this special text-book was selected for translation we can not discover. Not that there is anything bad in the book itself, for it is a good book of its kind, but there is nothing about it of such surpassing excellence that it should deserve this high compliment. The translation, in this view, simply seems unnecessary. The book is welcomed to every botanist's library, not because of its excellence as a text-book, but it gives profuse and most excellent illustrations, new statements of old facts, many new illustrations of facts, in short, just such a book as one likes to consult now and then in "working up" a subject.

It is divided into five parts, with no sub-divisions into chapters, and strikes one as being out of proportion for a "Text-book of General Botany." Part I deals with Morphology in about 100 pages, the plant organs being considered under the four heads of root, stem, leaf, and hairs. Part II, with about 60 pages, is devoted to Systematic Botany. Here the American student will be lost, and maybe he ought to be. The classification adopted is of course German, and probably more nearly expresses natural relationships than the confessedly artificial grouping that we use. But this aside, all this systematic presentation of orders in a "text-book" is so much barren waste, so far as class work is concerned. It reduces that part of the book to reference rather than to reading. Part III, with 70 pages, bears the title of Physiological Botany, but is all devoted to flowers and insects. It occurs to us that this title is a misnomer, and the space occupied by this very interesting subject is out of all proportion to the rest of the book. When one looks for a description of the process of "fecundation," he is met with the primitive statement that the pollen grain contains protoplasm, and that the embryo-sac is a cavity in the ovule filled with fluid (p. 168), and that the "mingling of the contents of the pollen-tube with those of the embryo-sac is the essential feature of the process of fecundation." It must be said that the subject of cross-pollination is beautifully worked out, both in illustrations and text. Part IV contains about 80 pages, and is entitled Anatomy and Physiology, though it would be hard to explain why one part is called Physiological Botany and another Physiology, although the former only deals with insects and flowers. At the opening of this part we are treated to an anomalous thing. Here, towards the end of the book, under anatomy and physiology, we encounter an introduction to the study of botany, giving its scope, its history, etc., with brief biographical sketches of the older systematists, followed by others who were physiologists. Some 30 pages is given

to a good and finely illustrated discussion of the cell. After this, the subject of "histology" is taken up, though why the study of cells would not come under that head it would be hard to guess. Then to physiology proper 10 pages are given! There can surely be no excuse for so reducing this great subject in a general text-book. Part V, with 40 pages, is entitled "The Lower Plants," under which title are grouped both cryptogams and phanerogams with their subdivisions, chief attention being given to the former. What mycologists will say to the following groups as correlatives is not hard to guess: protophytes, fungi, algæ, liverworts, mosses, ferns, horsetails, rhizocarps, clubmosses, conifers, monocotyledons, and dicotyledons. It is said that except in the protophytes spores are "the product of sexual conjugation," and that they are "destitute of an embryo having plumule, radicle, and cotyledons," though what their embryo does have is not said. So then, under the comprehensive title, "Systematic Botany," we have grouped only the phanerogams, while under the restricted title, "The Lower Plants," we have all plants grouped.

How much of this is due to the translator we have no means of judging. Our frank opinion, then, with respect to the book, is that it lacks perspective, proportion, arrangement, and proper titles; while it does have an abundance of capital illustrations and much most excellent information presented in an interesting way. While, therefore, it can never be considered a good "Text-Book of General Botany," as a treatise on botany it will find a place on our shelves and be frequently consulted.

Plant Life on the Farm. By Maxwell T. Masters, M. D., F. R. S. 16°, pp. iv, 132. New York: Orange Judd Company. 1885.

This little book is a step in the right direction. It is high time that our cultivators should be informed of some of the most important facts of physiological botany. They may be well informed about the structure of plants, for we have many good books treating of this subject, but simple and concise books upon how plants live are very few, and no department of botany can be more important to those whose whole occupation is to cultivate plants. The class addressed has neither time nor training to master and apply all the details of this subject, nor is it of practical importance that it should, but, as the author says, "experience shows the increasing necessity of furnishing him (the cultivator) with new tools and new weapons to enable him to utilize the resources of nature, and to contend against adverse circumstances. It is the object of this book to point out these resources and suggest methods of utilizing them." The subjects of the nine chapters are very suggestive, and treated, as they are, in a simple yet scientific way, give to the reader a fair knowledge of the life work of plants. The subjects are: Plant Nutrition, the work and the materials; Nutrition, the machinery; Growth; Sensitiveness; Development; Multiplication; The Battle of Life; Practical Inferences; Decay and Death. It is a good thing for science when some leading worker stops long enough to teach common people a few things that are useful for them to know. The other alternative is to leave it to quacks and professional book-makers who do it so badly that it had better not be done at all. Dr. Masters has been able to draw upon a great fund of experiments furnished by the famous experiment station at Rothamsted. A good point is made in trying to get the cultivator to understand how important to his own work is that of the microscopist and chemist, as the "life-history of a plant is, in essence, the life-history of protoplasm and of its covering the cell-wall," a thing which the "practical man" finds it difficult to realize. The author, of necessity, touches upon some very difficult problems, but is wise in not confusing his readers by discussing them, although properly leaving the impression that they are not fully understood, as for instance the function of chlorophyll, p. 28. Most of the definitions are very clear, when one considers that they are made for those with no basis of technical knowledge. Exception might be taken to the following, however, p. 49, where the exogenous stem is said to have woody bundles made of "wood-cells" and "bast cells," and on the

"*outer side of each bundle* is a thin layer of cambium." On the same page the endogens are said to have "their cambium tissue in the center of each bundle." A difference of opinion might also be held in reference to the statements on page 87, that "cross-fertilization secures variation," and self-fertilization represses it. We can cordially recommend the book, not only to the practical cultivator, but also to botanists, many of whom know far too little of the principles of physiological botany.

On the Structure of the Testa of Several Leguminous Seeds. By L. H. Pammel. Extracted from the Bullitin of the Torrey Botanical Club. Vol. xiii (1886), pp. 17–24, t. 2.

In this brochure, Mr. Pammel describes the structure of the seed coats of Phaseolus vulgaris, Gymnocladus Canadensis, Physostigma venenosum and Mucuna urens. The structure of the very hard seed-coats he finds quite homologous with that of less resistant ones, differing chiefly in the greater development of sclerenchyma cells which are commonly present. The work has been carefully done, and much of the extensive literature regarding leguminous seed-coats is cited by the author.

NOTES AND NEWS.

THE GERMAN imperial government has ordered the establishment of chairs of bacteriology at all universities of the empire.

THE PAPER of Dr. W. Pfeffer on intramolecular respiration, noticed in the March GAZETTE, is taken, as we are informed by Dr. N. L. Britton, from *Untersuchungen des botanischen Instituts in Tübingen*, vol. I.

THE ENUMERATION of the species of the genus Phyllosticta by George Martin is terminated in the March number of the *Journal of Mycology*. It includes seventy species, found upon sixty-four species of host plants.

EXTENSIVE BACTERIOLOGICAL studies are now carried on at the U. S. Army and Medical Museum at Washington. The most recent apparatus and methods are used, and the facilities are considered quite equal to those of German laboratories.

THE FOLLOWING new grasses are described by Dr. Geo. Vasey in the *Bulletin of the Torrey Club* for February: Panicum Nealleyi, Imperata brevifolia, Aristida Arizonica, A. Harvardii, and A. Orcuttiana. Seven new varieties belongingto other species are also described.

ÉDOUARD MORREN, the well-known professor of botany in the University of Liége, vice-president of the Royal Botanical Society of Belgium, editor of *Belgique Horticole* and of *Correspondance Botanique*, died on the 28th of February last, at the age of 52 years.

IN ANSWER to an enquiry, Professor Gray informs us that he is not quite disposed to place on sale copies of his papers in the American Academy's Proceedings and elsewhere, especially as he pretty freely presents them to his principal correspondents, so that there are not very many left over. Still, to oblige those whom he has to overlook or can not keep the run of, and to recover a portion of the cost, he has arranged that orders for them addressed to the curator of the Herbarium of Harvard University will as far as possible be filled, at the rate of thirty-five cents for each paper.

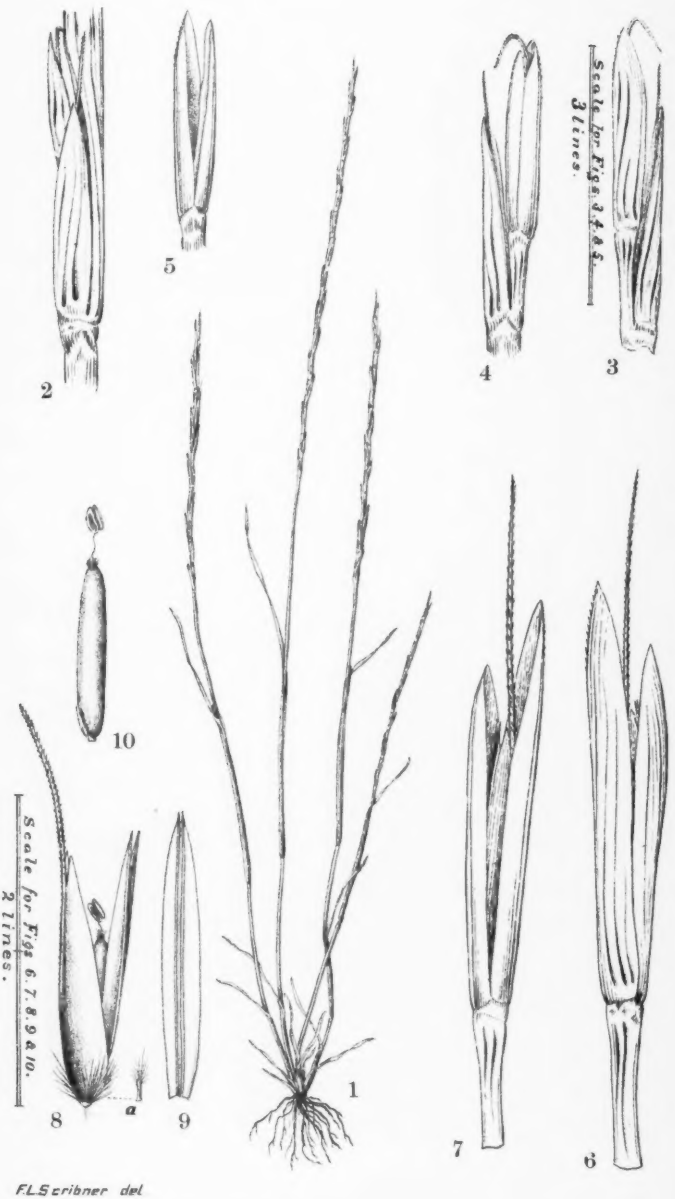
W. C. WALKER, F. R. M. S., of Utica, and H. H. Chase, M. D., of Geneva, N. Y., have issued a fascicle of eight quarto pages and two plates dealing with some new and rare diatoms. Twenty-two species are mentioned, all of which are figured. Of the forms marked as new five species are by Mr. Walker, two species and two varieties by Dr. Chase, two species by Prof. H. L. Smith, one species by Mr. E. S. Nott, and one variety by Mr. B. W. Thomas. The plates are photographs from free-hand drawings by Mr. Walker, and are fine examples of this kind of work. We suppose it is by a slip that the figures are said to be magnified 400 diameters, for being free-hand they must necessarily be variable. We are informed that this is to be followed by other numbers.

IN AN ARTICLE on horticultural botany read before the Western N. Y. Horticultural Society, of which extra copies have been distributed, Dr. E. L. Sturtevant suggests the words *pomiculture* and *olericulture* to embrace respectively fruit culture and vegetable culture. It is pointed out that the latter deals with plants which have a pedigree, being mostly raised each year from seed, while the former deals with plants without a pedigree, but with only a parentage, being mostly propagated by division. The one class of plants reproduces the various forms from seed with much certainty, which are properly called varieties, the other not being able to reproduce them with any certainty should not have the forms called varieties, but variations. Whenever a valuable variation occurs it is propagated indefinitely by division; should it also be capable of reproduction by seed, it becomes a true variety.

THE FIRST NUMBER of a new quarterly journal devoted to algæ, called *Notarisia*, has just appeared. It proposes to treat of the current bibliography of this branch of botanical science, to collate references and Latin descriptions of new species, to furnish communication between algologists, and to some extent to publish original articles. The journal is designed to be truly international; communications will be published in Italian, French, or Latin. The price will vary according to the required size, but will not exceed fifteen francs ($3.00) per annum. Subscriptions should be sent to the editors, Dr. G. B. de Toni and David Levi, S. Samuele 3422, Venice, Italy. The present number consists of sixty-four octavo pages with heliotype portrait of De Notaris, to whom the journal is dedicated. It also has an appendix of eight pages with two plates illustrating the genera of Florideæ. There is no doubt about the need of such a journal, and this gives promise of meeting the want.

OPPORTUNITY is again offered to any who desire, to obtain the whole or any part of the *Flora Danica*. This magnificent work was commenced in the latter part of the last century, and has been published by the liberality of the king of Denmark. It is now complete, excepting the index, and it is proposed to reprint such parts as may be called for. The entire work contains explanatory text and over *three thousand* plates representing 4000 species belonging to Denmark, Norway and Sweden, Iceland and Greenland. Single fascicles consisting of 60 plates with text can be had for 19 fr. 50 c., or, colored, for 55 fr. 50 c. Considerable discount will be made when 10 or more fascicles are ordered. The editor also proposes to issue from the same plates the following works: 1. *Icones Floræ Groenlandicæ* consisting of 330 plates with text, price, uncolored, 65 fr. 50 c. or, colored, 250 fr. 25 c.—2. *Arboretum Scandinavicum*, illustrations of the trees and shrubs of Denmark, Norway and Sweden, 160 plates, uncolored 40 fr., colored, 126 fr.—3. *Icones plantarum officinalium Scandinaviæ*, 300 plates, uncolored 60 fr., colored, 240 fr. Those who wish to obtain any of these works or the whole or part of the *Flora Danica* should communicate their wishes to the editor Dr. Joh. Lange, Thorvaldsens Vej 5 (V.) or to MM. Lehmann & Stage, Klareboderne 3, Copenhagen K. The *Flora Groenlandica* will be especially valuable to North American botanists.

WE LEARN FROM the *Bulletin de la Société de France* that S. Groslik has been carrying on experiments to determine the influence of light upon the development of the leaf-parenchyma. He selected for the purpose the leaves of Eucalyptus globulus which exhibit three distinct stages of development. The parenchyma of the very young leaf consists only of isodiametric cells, which the author designates as "primitive mesophyll." In the second stage the leaf is vertical and develops a layer of palisade parenchyma under both surfaces. In the third stage the leaf is horizontal and has a layer of palisade parenchyma as usual only under the upper surface, the palisade of the under side having gradually been transformed into spongy parenchyma. M. Groslik holds that these changes are induced by the change in the illumination and gives the following experiments to demonstrate this: Taking a leaf in the first phase of development, he kept it in a horizontal position when it developed palisade only on the upper face. Keeping a leaf in the second stage (i. e., one having palisade on both surfaces) in a constantly vertical position the inferior palisade did not become converted into spongy parenchyma. The author therefore argues that from the primitive mesophyll of the leaf either spongy or palisade parenchyma is developed and that the character of this adult mesophyll is dependent on the illumination, a strong direct illumination favoring the development of palisade and shade favoring the formation of spongy parenchyma. M. Groslik's conclusions are hardly new, but his experiments are interesting and can be used in laboratory demonstrations.



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